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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/808,231	03/23/2004	Son Van Nguyen	AMAT/8204/DSM/LOW K/JW	5033

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EXAMINER	
SARKAR, ASOK K	

ART UNIT	PAPER NUMBER
2891	

DATE MAILED: 07/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/808,231	NGUYEN ET AL.	
	Examiner	Art Unit	
	Asok K. Sarkar	2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/04 and 7/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: "Method of Forming Low Dielectric Constant porous Films".

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1 – 3, 5, 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Kapoor, US 5,864,172.

Regarding claim 1, Kapoor teaches a method for forming a porous dielectric film, comprising:

- forming a silicon based film having a water soluble compound dispersed therein, and removing at least a portion of the water soluble compound, thereby providing the porous dielectric film in column 2, lines 41 – 57.

Regarding claims 2 and 3, Kapoor teaches water soluble compound as GeO_2 in column 3, lines 48 – 53.

Regarding claim 5, Kapoor teaches the film is formed by CVD in column 5, lines 20 – 30.

Regarding claim 8, Kapoor teaches removing the water soluble compound by wet etching the silicon based film in column 6, lines 26 – 30.

4. Claims 1 – 3, 6, 7, 8, 10 and 17 – 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Gates, US 6,780,499.

Regarding claims 1 and 8, Gates teaches a method for forming a porous dielectric film, comprising:

- forming a silicon based film having a water soluble compound dispersed therein, and removing at least a portion of the water soluble compound, thereby providing the porous dielectric film in column 3, lines 3 – 40.

Regarding claims 2 and 3, Gates teaches water soluble compound as GeO_2 in column 6, lines 1 – 12.

Regarding claim 6, Gates teaches the film is formed by SOG in column 4, lines 41 – 55.

Regarding claim 7, Gates teaches the silicon based film is a carbon doped silcon based film in column 2, line 40.

Regarding claim 10, Gates teaches the dielectric constant of the porous dielectric film is less than 2.0 in between column 1, line 65 and column 2, line 3.

Regarding claims 17 – 19, Gates teaches a method for forming a porous

dielectric film, comprising:

- doping of controlled size nano phase compounds in a silicon based film and carbon doped using spin on glass (S.O.G.) to spin on the nano phase compounds that are selected from at least one member of the group consisting of germanium oxide (GeO_2) and removing at least a portion of the nano phase compounds dispersed in the silicon based film, thereby providing the porous dielectric film under the description "Summary Of The Invention" in column 1 and in column 4, lines 41 – 55.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gates, US 6,780,499 in view of Swanson, US 5,976,478.

Gates teaches that the water soluble compound can be any oxide that is water soluble in column 6, lines 1 – 9, but fails to teach the compound is boron oxide.

Swanson teaches that the silica particles that can be used as dielectric (see column 1, lines 25 – 30) can also be made porous by forming the silicate mixture and removing the water soluble boron oxide in column 2, lines 55 – 62 and also in column 8, lines 23 – 40 for the benefit of producing silica particles with internal prorosity and having unique properties in column 1, lines 47 – 50.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Gates and use boron oxide as one of the water soluble oxides in place of germanium oxide since boron oxide is water soluble and removable and also for the benefit of imparting the silica dielectric with internal porosity and having unique properties as taught by Swanson in column 1, lines 47 – 50.

9. Claims 9 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gates, US 6,780,499 in view of Sony, JP 10256363 (Abstract).

Gates fails to teach treating the porous dielectric film with an electron beam.

"Sony" teaches treating the porous dielectric film with an electron beam for the benefit of preventing gas absorption by the porous dielectric film (see the advantage in the abstract).

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Gates and treat the porous dielectric film with an electron beam for the benefit of preventing gas absorption by the porous dielectric film as taught by "Sony" in the advantage of the abstract.

10. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gates, US 6,780,499.

Gates teaches that the film produced by them is of very high strength and have pores of controllable size in column 2, lines 1 – 13, but fails to teach the porosity of the porous dielectric film is at least forty percent.

However, it would have been obvious to one with ordinary skill in the art at the time of the invention to control the porosity of the film since the strength as well as the dielectric constant both are controlled by porosity and therefore it would have been obvious to one with ordinary skill in the art at the time of the invention to judiciously adjust and control the parameter during the formation of the porous dielectric layer through routine experimentation and optimization to achieve optimum benefits (see MPEP 2144.05) and it would not yield any unexpected results.

Note that the specification contains no disclosure of either the critical nature of the claimed processes or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen methods or upon another variable recited in

a claim, the Applicant must show that the chosen methods or variables are critical (*Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir., 1990)). See also *In re Aller, Lacey and Hall* (10 USPQ 233 – 237).

11. Claims 12, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kapoor, US 5, 864,172 in view of Maeda, US 5,324,539.

Kapoor teaches limitations of these claims as have been described earlier in rejecting claims 1 – 3, 5 and 8. Kapoor teaches CVD precursor of germane but fails to teach doping of nano phase compounds in a silicon based film using chemical vapor deposition (CVD) precursors selected from at least one member of the group consisting of organogermanium compounds.

Maeda teaches that silicon oxide films containing Ge can be prepared by CVD using organogermanium compounds in column 8, lines 65 – 68 for the benefit of overcoming the handling problems with the hydride compounds in column 2, lines 18 – 23.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Kapoor and use organogermanium compounds for the Ge precursor for the benefit of overcoming the handling problems with the hydride compounds as taught by Maeda in column 2, lines 18 – 23.

12. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kapoor, US 5, 864,172 in view of Maeda, US 5,324,539 as applied to claim 12 above, and further in view of Gates, US 6,780,499.

Kapoor in view of Maeda fails to teach the silicon based film is a carbon doped

film.

Gates teaches a low dielectric constant porous silica based film containing carbon in column 2, lines 30 – 42 for the benefit of providing a porous film with improved mechanical properties in column 1, lines 59 – 62.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Kapoor and use the silicon based film that is a carbon doped film for the benefit of providing a porous film with improved mechanical properties as taught by Gates in column 1, lines 59 – 62.

13. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kapoor, US 5, 864,172 in view of Maeda, US 5,324,539 as applied to claim 12 above, and further in view of Sony, JP 10256363 (Abstract).

Limitation of this claim has been described earlier in rejecting claims 9 and 20.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 571 272 1970. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William B. Baumeister can be reached on 571 272 1722. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

15. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Asok Kumar Sarkar

Asok K. Sarkar
July 25, 2005

Primary Examiner